

Warm Up

$$\textcircled{1} \frac{15}{2(x+1)} \div \frac{\cancel{2} \cdot 6}{\cancel{2} x} - \frac{1}{2} \cdot \frac{\cancel{x}}{\cancel{x}}$$

$$\text{LCD: } x \cdot 2 = 2x$$

$$\frac{12}{2x} - \frac{x}{2x}$$

$$\downarrow$$
$$\frac{15}{2(x+1)} \div \frac{12-x}{2x}$$

$$\frac{15}{\cancel{2}(x+1)} \cdot \frac{\cancel{2}x}{12-x} = \frac{15x}{(x+1)(12-x)}$$

$$\textcircled{2} \quad \frac{2}{x+2} \div \frac{\frac{x}{x} \cdot \frac{1}{x+2}}{\frac{x}{x} \cdot \frac{(x+2)}{(x+2)}} + \frac{2}{x} \cdot \frac{(x+2)}{(x+2)}$$

$$\text{LCD: } x(x+2)$$



$$\frac{x}{x(x+2)} + \frac{2x+4}{x(x+2)}$$

$$\frac{2}{x+2} \div \frac{3x+4}{x(x+2)}$$

$$\frac{2}{\cancel{x+2}} \cdot \frac{\cancel{x(x+2)}}{3x+4} = \frac{2x}{3x+4}$$

$$\textcircled{3} \frac{\frac{4}{\cancel{(x-4)(x+4)}}}{\cancel{(x-4)(x+4)}} - \frac{10}{(x-4)(x+4)} \div \frac{\cancel{(x-4)} \cdot 5}{\cancel{(x-4)} x+4} + \frac{2}{x-4} \cdot \frac{\cancel{(x+4)}}{\cancel{(x+4)}}$$

$$\text{LCD: } (x-4)(x+4)$$

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$$\frac{\frac{4x^2-64}{\cancel{4(x^2-16)}}}{(x-4)(x+4)} - \frac{10}{(x-4)(x+4)} \div \frac{5x-20}{(x-4)(x+4)} + \frac{2x+8}{(x-4)(x+4)}$$

$$\frac{4x^2-74}{(x+4)(x-4)} \div \frac{7x-12}{(x-4)(x+4)}$$

$$\frac{4x^2-74}{\cancel{(x-4)(x+4)}} \cdot \frac{\cancel{(x-4)(x+4)}}{7x-12} =$$

$$\boxed{\frac{4x^2-74}{7x-12}}$$

$$\textcircled{4} \quad \frac{2}{x} - \frac{\frac{(x+2)}{(x+2)} 3}{4x} + \frac{5}{x+2} \cdot \frac{4x}{4x}$$

$$\downarrow$$

$$\text{LCD: } 4x(x+2)$$

$$\frac{3(x+2)}{4x(x+2)} + \frac{20x}{4x(x+2)}$$
~~$$\frac{23x+6}{4x(x+2)}$$~~

$$\frac{2}{x} \div \frac{23x+6}{4x(x+2)}$$

$$\frac{2}{\cancel{x}} \cdot \frac{4\cancel{x}(x+2)}{23x+6} = \boxed{\frac{8(x+2)}{23x+6}}$$

9.6 - Rational Equations

fractions
x's

solving
x =

Cross multiplying - one fraction

Ex. 1:

$$\frac{x}{x+2} = \frac{5}{3}$$

$$x(x+2) = 5 \cdot 3$$

$$x^2 + 2x = 15$$

$$x^2 + 2x - 15 = 0$$

$$(x-3)(x+5) = 0$$

$$x-3=0$$

$$x=3$$

$$x+5=0$$

$$x=-5$$

Ex 2:

$$\frac{2}{x^2 - x} = \frac{1}{x - 1}$$

$$2(x - 1)$$

$$x^2 - x = 2x - 2$$

$$-2x + 2 - 2x + 2$$

$$x^2 - 3x + 2 = 0$$

$$(x - 2)(x - 1) = 0$$

$$x - 2 = 0$$

$$x = 2$$

$$x - 1 = 0$$

$$x = 1$$

$$\frac{2}{(2)^2 - 2} = \frac{1}{2 - 1}$$

$$\frac{2}{(1)^2 - 1} = \frac{1}{1 - 1}$$

$$\frac{2}{0} = \frac{1}{0}$$

PRACTICE

①

$$\frac{x}{5} = \frac{7}{3}$$

$$\frac{3x}{3} = \frac{35}{3}$$

$$x = 35/3$$

②

$$\frac{6}{x+2} = \frac{x}{4}$$

$$24 = x^2 + 2x$$

$$0 = x^2 + 2x - 24$$

$$0 = (x+6)(x-4)$$

$$x = -6, 4$$

$$\textcircled{3} \quad \frac{7}{x+1} = \frac{5}{x-3}$$

$$\begin{array}{r} 7x - 21 = 5x + 5 \\ -5x \quad -5x \end{array}$$

$$\begin{array}{r} 2x - 21 = 5 \\ +21 \quad +21 \end{array}$$

$$2x = 26$$

$$x = 13$$

$$\textcircled{4} \quad \frac{-56}{x} = \frac{9-x}{2}$$

$$\begin{array}{r} -112 = 9x - x^2 \\ -9x + x^2 \end{array}$$

$$x^2 - 9x - 112 = 0$$

$$(x-16)(x+7) = 0$$

$$x = 16, -7$$

method 2: multiply by LCD

- fraction
- denominators.

$$\text{Ex. 1: } \frac{2}{\cancel{3}} \cdot \frac{1}{\cancel{3}x} = \frac{4}{\cancel{3}}$$

$$\text{LCD: } x \cdot 3 = 3x$$

$$6 \times x = 12$$

$$\boxed{x=6}$$

$$\textcircled{2} \quad \frac{4x+1 \cdot \cancel{(x+1)(x-1)}}{\cancel{(x+1)}} = \frac{12 \cdot \cancel{(x+1)(x-1)}}{\cancel{x^2+1} \cdot \cancel{(x+1)(x-1)}} + \frac{3 \cdot (x+1)(x-1) \cdot \cancel{x}}{\cancel{1}}$$

$$\begin{array}{r} 4x^2 - 3x - 1 = 3x^2 + 9 \\ -3x^2 \quad \quad -3x^2 \end{array}$$

$$\text{LCD: } (x+1)(x-1)$$

$$\begin{array}{r} x^2 - 3x - 1 = 9 \\ -9 \quad -9 \end{array}$$

$$(4x+1)(x-1) = 12 + 3(x+1)(x-1)$$

$$4x^2 - 4x + x - 1 = 12 + 3(x^2 - 1)$$

$$4x^2 - 3x - 1 = 12 + 3x^2 - 3$$

$$4x^2 - 3x - 1 = 3x^2 + 9$$

$$x^2 - 3x - 10 = 0$$

$$(x+2)(x-5) = 0$$

$$\boxed{x = -2, 5}$$

$$\textcircled{1} \frac{x \cdot \cancel{(x+9)}}{\cancel{(x+9)}} = \frac{9 \cdot \cancel{(x+9)}}{\cancel{(x+9)}} + \frac{2}{1} \cdot (x+9)$$

$$\text{LCD: } (x+9)$$

$$x = 9 + 2(x+9)$$

$$x = 9 + 2x + 18$$

$$x = 2x + 27$$

$$\begin{array}{r} -2x \quad -2x \\ x = 2x + 27 \end{array}$$

$$-x = 27$$

$$\textcircled{x = -27}$$

$$\textcircled{2} \quad \frac{7 \cdot \cancel{3(x-4)}}{\cancel{3(x-4)} \cdot \frac{3x-12}{\cancel{3(x-4)}}} - \frac{1 \cdot \cancel{3(x-4)}}{\cancel{3(x-4)}} = \frac{2}{3} \cdot \cancel{3(x-4)}$$

$$\text{LCD: } 3 \cdot (x-4)$$

$$7 - 3 = 2(x-4)$$

$$4 = 2x - 8$$

$$12 = 2x$$

$$\textcircled{6 = x}$$